

GRAMMER AG Seating Systems

Grammer seat MSG 95 EAC/741 with active seat suspension

ride comfort

DLG Test Report 5542 F



Manufacturer and registering company

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Technik & Betriebsmittel

Evaluation – short version

Test criterion	Test result	Evaluation
	Fendt 818 / John Deere 8520	
– Reduction of the acceleration acting on the driver in the z-direction	Very good	++
– Time and work needed for seat adjustment	Little due to automatic adaptation to the driver's weight	++
– Overall ride comfort	Very good	++

_____ Evaluation range: ++ / + / o / - / -- (o = standard)

Short description

The driver's seat from Grammer is an actively controlled seat. With the aid of a position sensor, the current position and the acceleration acting upon the seat are measured at 250 Hz (250 times per second).

This means that based on the signals the electronic controller

always tries to keep the position of the seat surface at a constant height with the aid of an air spring and an additional air reservoir. This reduces the acceleration acting on the driver in the vertical direction. The system is supplied with energy by a 12-V air compressor. Height adjustment is operated by means of a switch. Suspension and damping

in the direction of travel and the lateral direction are installed and can be blocked, but they are not actively controlled.

Since the seat only needs a 12-V electric connection, it can practically be installed in every tractor.

Content of the test

For the test, two tractors were available: a Fendt Vario 818 and a John Deere 8520. Both tractors had a suspended front axle. The Fendt tractor was additionally equipped with an air-suspended cab. The

John Deere model featured a cab sprung by rubber elements. For comparison, all measurements were carried out with both the active seat and conventional, air-suspended seats.

Other criteria were not tested.

Measuring techniques



Figure 1:
Grammer seat MSG 95 EAC/741 in the tractor with measuring equipment.

- The 100 m long seat test track of the DLG Test Centre, which conforms to 78/764/EEC, and an asphalted field road near the Test Centre were used as measuring paths.
- On the seat test track, measurements were carried out with an empty tractor at speeds between 8 km/h and 32 km/h in steps of 4 km/h and with a ballasted tractor at speeds of up to 24 km/h. On the road, measurements took place at speeds of 30 km/h and 40 km/h.
- Acceleration sensors for the x-, y-, and z-direction were installed in the cab near the seat attachment and on the seat.
- The measurement values of acceleration were registered at a scanning frequency of 600 Hz and used to calculate the actual value in intervals of approximately one second. The values of the two sensors were evaluated according to ISO 8041 (z: evaluation filter Wk).
- all measurement runs were carried out with two drivers. The lighter driver had a body weight of 75 kg, whereas the other one weighed 98 kg.

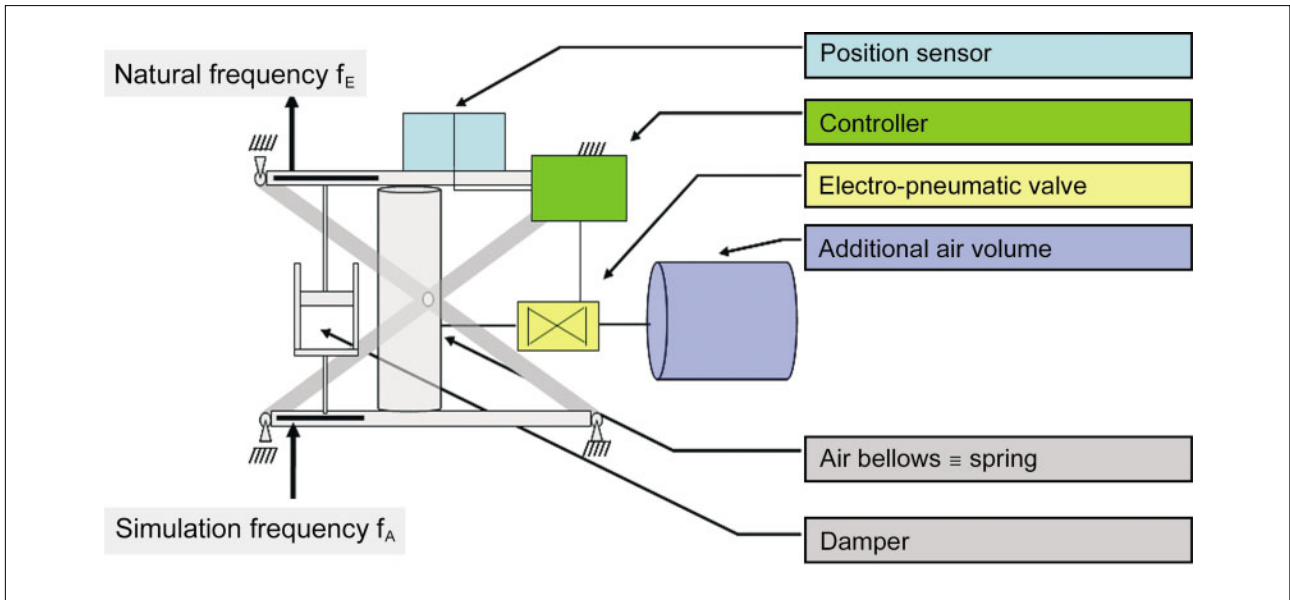


Figure 2:
System sketch

Tractor data

		Fendt 818	John Deere 8520
Total weight	kg	7000	10740
Front axle load	kg	2650	5210
Rear axle load with ballast	kg	4350	5530
Total weight	kg	9400	13335
Front axle load	kg	2680	5480
Rear axle load	kg	6720	7855
Front tyres		MICHELIN XM 108 540/65R30 143 A8	GOODYEAR Super Traction Radial DT 820 600/70R30 152 A8
Rear tyres		MICHELIN XM 108 650/65R42 158 A8	GOODYEAR Super Traction Radial DT 820 710/70R42 168 A8
Front tyre inflation pressure	bar	1,4	1,4
Rear tyre inflation pressure	bar	1,2	1,2



Figure 3:
Test tractor JOHN DEERE 8520



Figure 4:
Test tractor FENDT 818

Test results and individual evaluations

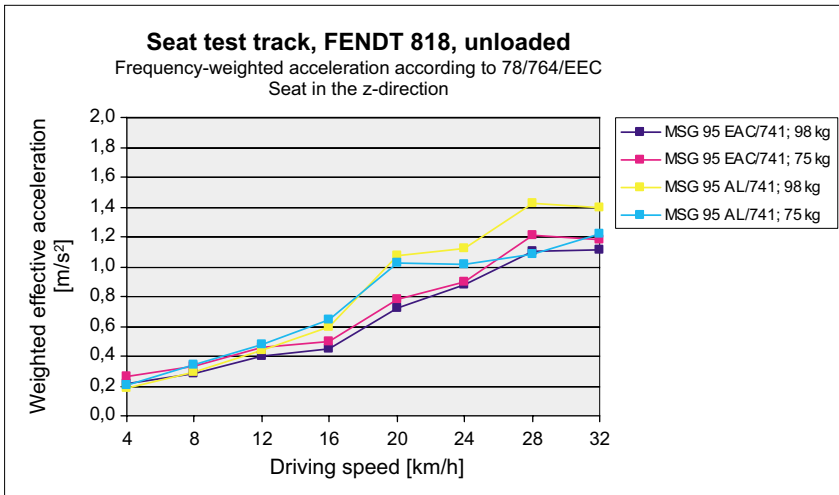


Diagram 1: Fendt Vario 818, weighted actual values of acceleration in the z-direction (vertical) on the surface of the two seats as a function of driving speed (empty tractor), measurement with two drivers

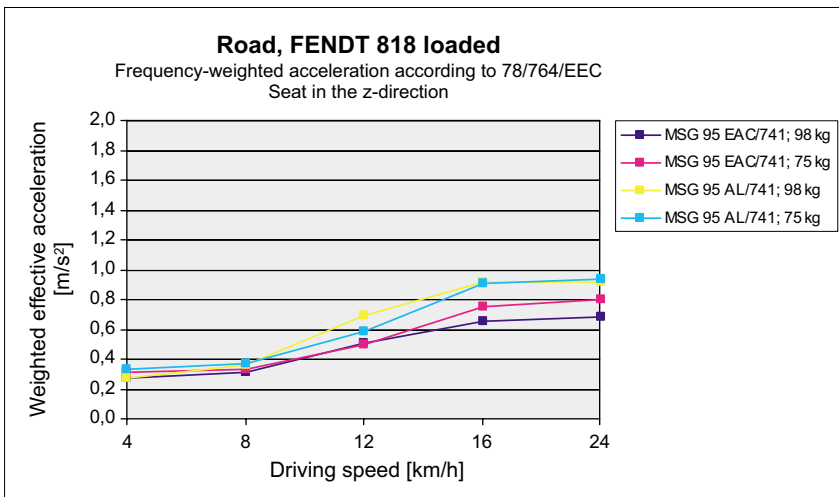


Diagram 2: Fendt Vario 818, weighted actual values of acceleration in the z-direction (vertical) on the surface of the two seats as a function of driving speed (ballasted tractor), measurement with two drivers

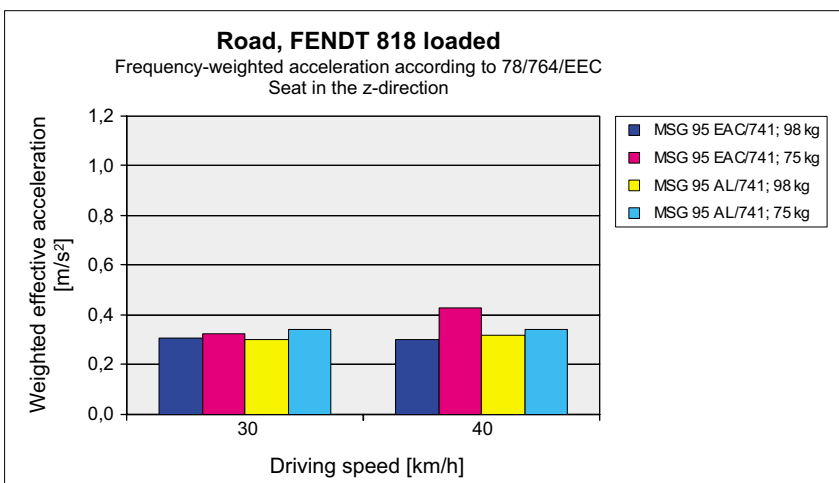


Diagram 3: Fendt Vario 818, weighted actual values of acceleration in the z-direction (vertical) on the surface of the two seats as a function of driving speed (ballasted tractor), measurement with two drivers

Measurement results on the seat test track according to 78/764/EEC

Fendt 818 Vario

Measurement results Fendt 818 Vario

The different course of the four curves clearly shows how accelerations on the seat increase with driving speed. On the actively suspended seat MSG 95/EAC/741, lower acceleration values are measured than on the conventional seat, in particular in the 16 km/h to 24 km/h speed range. The virtually uniform course of the curves also shows that the actively suspended seat can better compensate for different drivers' weights than the seat MSG 95AL/741.

On the ballasted tractor (total weight: 9,400 kg), the measured values are lower than on an empty tractor. Once again, the actively suspended seat provides a reduction of the acceleration acting on the driver even as compared with the very good seat MSG 95AL/741.

The Fendt 818 was equipped with a pneumatical cab suspension. Therefore the vibrations at the seat base were relatively low.

Measurement results on the road

Given the relatively small impulses due to the unevenness of the road, both seats can reduce acceleration efficiently at a driving speed of 30 km/h.

John Deere 8520

Measurement results John Deere 8520

The measurements carried out with the light driver in the John Deere tractor equipped with a non-suspended cab show that already at speeds of more than 12 km/h significantly more acceleration forces act on the driver in the conventional seat than on the heavy driver. In most cases, the actively suspended seat can reduce the values measured with the light driver to the level measured with the heavy driver on both the active and the conventionally suspended seat.

On a ballasted tractor, the course of acceleration over the driving speed is virtually the same as on the empty tractor. The values measured with the light driver on the normal seat are the highest. All other measured versions show similar results.

The John Deere 8520 was equipped with a mechanical cab suspension (rubber mountings). Therefore the vibrations at the seat base are comparatively higher than for pneumatically suspended cabs.

Measurement results on the road

The diagram clearly shows that the actively suspended seat mainly provides advantages for the light driver. For the heavier driver, the results at 30 km/h remain the same.

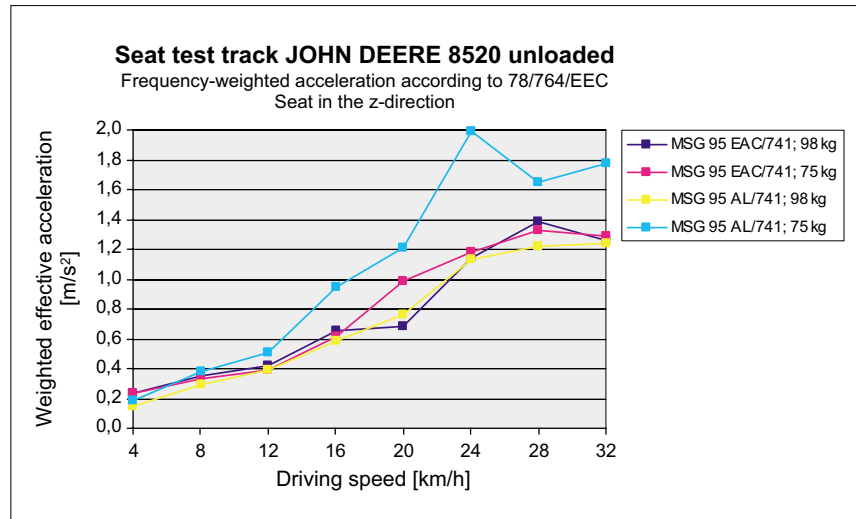


Diagram 4: John Deere 8520, weighted actual values of acceleration in the z-direction (vertical) on the surface of the two seats as a function of driving speed (empty tractor), measurement with two drivers.

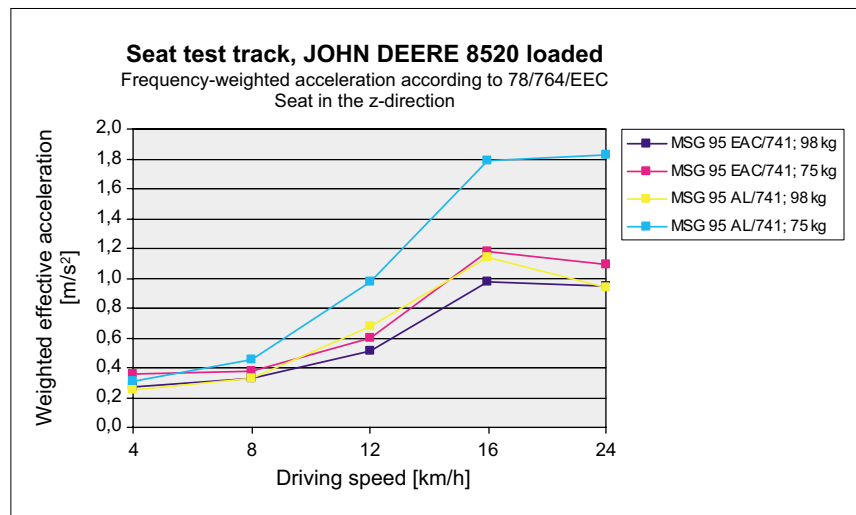


Diagram 5: John Deere 8520, weighted actual values of acceleration in the z-direction (vertical) on the surface of the two seats as a function of driving speed (ballasted tractor), measurement with two drivers.

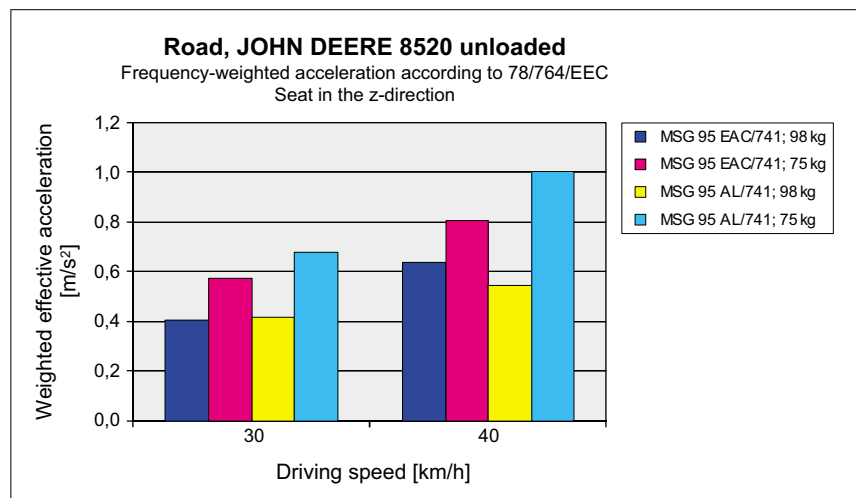


Diagram 6: John Deere 8520 unloaded, weighted actual values of acceleration in the z-direction (vertical) on the surface of the two seats as a function of driving speed (ballasted tractor), measurement with two drivers.

Summary and evaluation

Seats in agricultural tractors are intended to keep the influence of vibrations away from the driver due to suitable suspension and damping. Especially on very uneven roads, mechanical or air-sprung seat systems quickly reach their limits. The seat MSG 95EAC/741 developed by Grammer with an

active, electronically controlled suspension is able to reduce harmful acceleration in the vertical direction in particular for light drivers. The measurements have shown that the seat increases ride comfort in a wide driving speed range. It must be emphasized that the EAC seat did not hit the upper

or lower limit stop during the test rides. Due to the electronically controlled automatic function, it is very easy to adjust the seat to the weight and the size of the driver.

Test

Realization of the test

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